CLAIMS

What is claimed is:

1. An exhaust-vibration decoupling connector comprising:

an inlet tube extended downstream from a decoupler inlet to proximate an upstream portion of a damper fixture, said inlet tube having outlet radial bend around a circumference on an upstream end to interlock with an outlet tube;

an outlet tube extended upstream from a decoupler outlet to proximate a downstream portion of the damper fixture, said outlet tube having an inward radial bend on a downstream end which interlocks with the bend on the inlet tube;

the damper fixture being proximate midway between the decoupler inlet and the decoupler outlet;

a vibration damper positioned removably in the damper fixture;

a bellows having an upstream bellows attachment proximate the decoupler inlet;

the bellows having a downstream bellows attachment proximate the decoupler outlet;

the bellows having a bellows inside perimeter that is positioned radially outward predeterminedly from a radially outside perimeter of the vibration damper;

the bellows inside perimeter including inside peripheries of undulations of the bellows;

a flex cover having an upstream flex attachment proximate the decoupler inlet;

the flex cover having a downstream flex attachment proximate the decoupler outlet;

the flex cover having a cover inside perimeter that is positioned proximate a bellows outside perimeter;

a shield sleeve having a shield attachment proximate the decoupler outlet; and

the shield sleeve having a shield inside perimeter that is positioned radially outward predeterminedly from a radially outside perimeter of the flex cover.

2. The exhaust-vibration decoupling connector of claim **1** wherein:

the upstream bellows attachment includes an upstream bellows sleeve extending downstream axially a predetermined attachment distance from proximate the decoupler inlet to a first undulation wall that is extended radially intermediate the upstream bellows sleeve and a first side of a first undulation of the bellows;

the downstream bellows attachment includes a downstream bellows sleeve extending upstream axially a predetermined attachment distance from proximate the decoupler outlet to a second undulation wall that is extended radially intermediate the downstream bellows sleeve and a second side of a last undulation of the bellows;

the upstream bellows sleeve includes an inside periphery that is positioned removably on an outside periphery of a fastener portion of the inlet tube; and

the downstream bellows sleeve includes an inside periphery that is positioned removably on an outside periphery of a fastener portion of the outlet tube.

3. The exhaust-vibration decoupling connector of claim **2** wherein:

the upstream flex attachment includes an upstream flex-cover sleeve extending downstream axially a predetermined attachment distance from proximate the decoupler inlet to a first flex-cover wall that is extended radially intermediate the upstream flex-cover sleeve and a first attachment side of the flex cover; and

the downstream flex attachment includes a downstream flex-cover sleeve extending upstream axially a predetermined attachment distance from proximate the decoupler outlet to a second flex-cover wall that is extended radially intermediate the downstream flex-cover sleeve and a second attachment side of the flex cover.

4. The exhaust-vibration decoupling connector of claim **3** wherein:

the upstream flex-cover sleeve includes an inside periphery that is positioned removably on an outside periphery of the upstream bellows sleeve; and

the downstream flex-cover sleeve includes an inside periphery that is positioned removably on an outside periphery of the downstream bellows sleeve.

5. The exhaust-vibration decoupling connector of claim **1** wherein:

the inlet tube is circumferential with an inside periphery and an outside periphery;

the outlet tube is circumferential with an inside periphery and an outside periphery;

the inside periphery and the outside periphery of the inlet tube are predeterminedly smaller than the inside periphery and the outside periphery of the outlet tube;

the damper fixture includes an inlet-tube step extended radially inward to a damper seat having an axial downstream extension of the inlet tube;

the damper fixture includes an outlet-tube step extended radially inward to predeterminedly proximate an outside periphery of the damper seat;

the inlet-tube step includes a first side of the damper fixture; and

the outlet-tube step includes a second side of the damper fixture.

6. The exhaust-vibration decoupling connector of claim **5** wherein:

the outlet-tube step is articulated to allow axial and pivotal travel of the outlet tube in relation to the inlet tube predeterminedly.

7. The exhaust-vibration decoupling connector of claim **5** wherein:

the vibration damper includes a mesh-wire washer having an inside periphery that is positioned removably on the damper seat, an outside periphery that is predeterminedly smaller than the bellows inside periphery, a first side proximate the inlet-tube step and a second side proximate the outlet-tube step.

8. The exhaust-vibration decoupling connector of claim **5** wherein:

the vibration damper includes a wave-spring damper having one or more wave springs intermediate wave-spring washers in detachably sealed contact with the inlet-tube step and the outlet-tube step.

9. The exhaust-vibration decoupling connector of claim **5** wherein:

the vibration damper includes a helical-spring damper;

the helical-spring damper has a first side in detachable contact with the inlet-tube step and a second side in detachably contact with the outlet-tube step.

10. The exhaust-vibration decoupling connector of claim **5** wherein:

the vibration damper includes a spring-side damper having a helical spring in a circumferential channel with a first wall adjacent to the inlet-tube step and a second wall adjacent to the outlet-tube step;

the circumferential channel is arcuate intermediate the first wall and the second wall; and

the first wall and the second wall have inside peripheries proximate the outside periphery of the damper seat.

11. The exhaust-vibration decoupling connector of claim **1** and further comprising:

the flex cover includes a heat-resistant and flexible material that is reinforced with wire network predeterminedly.

12. The exhaust-vibration decoupling connector of claim **1** wherein:

the flex cover includes braided-wire material.

13. The exhaust-vibration decoupling connector of claim **12** wherein:

the flex cover includes a braid cap that is positioned intermediate the upstream flex attachment and exhaust-outlet structure to which the exhaust-vibration decoupling connector is attachable.

14. The exhaust-vibration decoupling connector of claim **1** wherein:

the upstream bellows attachment is articulated for sealed attachment to a predetermined exhaust-outlet structure; and

the downstream bellows attachment is articulated for sealed attachment to a predetermined exhaust-treatment structure that is fluidly downstream from the exhaust-outlet structure.

15. The exhaust-vibration decoupling connector of claim **13** wherein:

the upstream bellows attachment is disposed a snug-fit distance from the downstream bellows attachment for fitting snugly intermediate the exhaust-outlet structure and the exhaust-treatment structure predeterminedly.

16. The exhaust-vibration decoupling connector of claim **15** wherein:

the shield sleeve has a shield length that is less than the snug-fit distance for allowing axial distance change between the decoupler inlet and the decoupler outlet and for allowing pivotal movement of the decoupler outlet predeterminedly.

17. The exhaust-vibration decoupling connector of claim **1** wherein:

the bellows includes flexibly parallel walls intermediate arcuately flexible floors and roofs.

18. The exhaust-vibration decoupling connector of claim **17** wherein:

the bellows includes oppositely disposed ends that are buttressed against oppositely disposed end walls of the flex cover.

19. The exhaust-vibration decoupling connector of claim **1** wherein:

the bellows includes damping filler intermediate internal walls of undulations of the bellows.

20. The exhaust-vibration decoupling connector of claim **19** wherein:

the damping filler includes mesh wire.

21. An exhaust-vibration decoupling connector comprising:

an inlet tube extended downstream from an upstream portion of the inlet tube proximate a decoupler inlet to proximate an upstream portion of a damper fixture, said inlet tube having outward radial bend around a circumference on an upstream end to interlock with an outer tube;

an outlet tube extended upstream from a downstream portion of the outlet tube proximate a decoupler outlet to proximate a downstream portion of the damper fixture, said outlet tube having an inward radial bend on a downstream end which interlocks with the bend on the inlet tube;

the damper fixture being proximate midway between the decoupler inlet and the decoupler outlet;

a vibration damper positioned removably in the damper fixture;

a bellows having an upstream bellows attachment proximate the decoupler inlet;

the bellows having a downstream bellows attachment proximate the decoupler outlet;

the bellows having a bellows inside perimeter that is positioned radially outward predeterminedly from a radially outside perimeter of the vibration damper;

the bellows inside perimeter including inside peripheries of the bellows;

a flex cover having an upstream flex attachment proximate the decoupler inlet;

the flex cover having a downstream flex attachment proximate the decoupler outlet; and

the flex cover having a cover inside perimeter that is positioned proximate a bellows outside perimeter.

22. The exhaust-vibration decoupling connector of claim **21** wherein:

the upstream bellows attachment includes an upstream bellows sleeve extending downstream axially a predetermined attachment distance from proximate the decoupler inlet to a first undulation wall that is extended radially intermediate the upstream bellows sleeve and a first side of a first undulation of the bellows;

the downstream bellows attachment includes an downstream bellows sleeve extending upstream axially a predetermined attachment distance from proximate the decoupler outlet to a second undulation wall that is extended radially intermediate the downstream bellows sleeve and a second side of a last undulation of the bellows;

the upstream bellows sleeve includes an inside periphery that is positioned removably on an outside periphery of a fastener portion of the inlet tube;

the downstream bellows sleeve includes an inside periphery that is positioned removably on an outside periphery of a fastener portion of the outlet tube;

the inlet tube is circumferential with an inside periphery and an outside periphery;

the outlet tube is circumferential with an inside periphery and an outside periphery;

the inside periphery and the outside periphery of the inlet tube are predeterminedly smaller than the inside periphery and the outside periphery of the outlet tube;

the damper fixture includes an inlet-tube step extended radially inward to a damper seat having an axial downstream extension of the inlet tube;

the damper fixture includes an outlet-tube step extended radially inward to predeterminedly proximate an outside periphery of the damper seat;

the inlet-tube step includes a first side of the damper fixture; and

the outlet-tube step includes a second side of the damper fixture.

23. The exhaust-vibration decoupling connector of claim **22** wherein:

the outlet-tube step is articulated to allow axial and pivotal travel of the outlet tube in relation to the inlet tube predeterminedly.

24. The exhaust-vibration decoupling connector of claim **22** wherein:

the vibration damper includes a mesh-wire washer having an inside periphery that is positioned removably on the damper seat, an outside periphery that is predeterminedly smaller than the bellows inside periphery, a first side proximate the inlet-tube step, and a second side proximate the outlet-tube step.

25. The exhaust-vibration decoupling connector of claim **22** wherein:

the vibration damper includes a helical-spring damper;

26. The exhaust-vibration decoupling connector of claim **22** wherein:

the vibration damper includes a wave-spring damper.

27. The exhaust-vibration decoupling connector of claim **22** wherein:

the vibration damper includes a spring-side damper having a helical spring in a circumferential channel with a first wall adjacent to the inlet-tube step and a second wall adjacent to the outlet-tube step;

the circumferential channel is arcuate intermediate the first wall and the second wall; and

the first wall and the second wall have inside peripheries proximate the outside periphery of the damper seat.

28. The exhaust-vibration decoupling connector of claim **21** wherein:

the upstream bellows attachment is articulated for sealed attachment to a predetermined exhaust-outlet structure; and

the downstream bellows attachment is articulated for sealed attachment to a predetermined exhaust-treatment structure that is fluidly downstream from the exhaust-outlet structure.

29. The exhaust-vibration decoupling connector of claim **21** wherein:

the upstream bellows attachment is disposed a snug-fit distance from the downstream bellows attachment for fitting snugly intermediate the exhaust-outlet structure and the exhaust-treatment structure predeterminedly.

30. The exhaust-vibration decoupling connector of claim **21** wherein:

the bellows includes flexibly parallel walls intermediate arcuately flexible floors and roofs.

31. The exhaust-vibration decoupling connector of claim **21** wherein:

the bellows includes damping filler intermediate internal walls of undulations of the bellows.

32. The exhaust-vibration decoupling connector of claim **21** wherein:

the damping filler includes mesh-wire rings.